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NATURAL HISTORY MUSEUM, SAN DIEGO, CALIF.

W. S. WRIGHT

ENTOMOLOGICAL NEWS

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North American Institutions Featuring Lepidoptera.

I. The Natural History Museum, San Diego, California.

By J. D. GUNDER, Pasadena, California.

(Plate II.)

[This is the first article of an illustrated series describing several of America's important entomological centers. It is hoped that the information about these institutions will be of interest to the readers of the ENTOMOLOGICAL NEWS. The illustrations will, we hope, allow everyone to become more personally acquainted with the men about whom they have read or with whom they have corresponded in the past.—Author.]

Anyone visiting the City of San Diego in Southern California is struck by the beauty and magnitude of its famous Balboa Park. Within this park were erected the buildings of the Panama-California Exposition in 1915-1916, and one of these ornate structures is now the permanent home of the Natural History Museum. This institution is a private enterprise and although receiving some city funds, was largely dependent upon public support until 1920, when the Scripps family of San Diego left it a substantial foundation. Since then, and mostly through the efforts of the present director, Mr. Clinton G. Abbott, an ornithologist, the Museum has been enlarged and its scope of public service broadened. Mr. Abbott's wisely pursued policy of "local natural history first" is giving the southwest a really thorough and useful knowledge of its immediate environs.

In 1874, when San Diego was a little town and people came down the coast by means of horse stages or weekly boat, several naturalists who had been meeting at each other's homes, met in the law offices of Daniel Cleveland, a botanist, and

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founded the original San Diego Natural History Society. Among this group was O. N. Sanford, a coleopterist, who is considered the first curator of entomology for the present institution. As years went by Mr. George Field became the second curator. Mr. Field is still active and though not now connected with the Museum, is known to hundreds of lepidopterists around the country because of his commercial insect dealings dating back to the time when L. E. Ricksecker, the coleopterist, and Frank Stephens, the naturalist, were in their prime.

Mr. W. S. Wright, the present curator of entomology whose picture accompanies this article, needs little introduction. When one thinks of *Geometridae* (moths), one thinks of "W. S." right away! He has been collecting Lepidoptera for about thirty-five years and there are many new names listed to his credit. Most of his papers will be found published in the Entomological News, Jl. N. Y. Ent. Soc., Proc. Calif. Acad. Sci. and lately in the Trans. of the local Museum. Mr. Wright was born in La Salle Co., Illinois, on April 23, 1866, and after attending Doane College, Nebraska, went to Columbia University in New York. He has three sons and two daughters.

The entomological activities of the San Diego Museum really began in 1923 when it acquired by donation the Wright collection of insects. Two rooms in the building are devoted to entomological research and there is a sizeable display of local and exotic lepidoptera on view to the public. Mr. Wright estimates that there are about fifty thousand specimens of butterflies and moths in the mounted collections which are contained in thirty wooden cases of thirteen drawers each. He has represented practically all of the lepidoptera from San Diego County and has specialized for years upon material in long series from this section. The type and paratype specimens are not kept separate at present, but it is proposed to give them that advantage within the year.

Mr. Wright asks me to say that all entomologists will be especially welcomed by him should they come to San Diego and if they are visiting in Southern California, not to pass by his city.

The Life History of the Goldenrod Beetle, Trirhabda canadensis Kirby (Coleop.: Chrysomelidae).*

By W. V. Balduf, University of Illinois.

Introductory.

Trirhabda canadensis, now generally referred to in the literature as the goldenrod beetle, was described by Kirby in 1837, under the generic name *Galeruca.* Leconte revised the Galerucides of North America in 1865, and erected the new genus *Trirhabda* to which *canadensis* was then transferred. The beetle is seven to eight millimeters long, with seven longitudinal stripes,—two dorsal and two marginal dull yellow, and two lateral and the median black. Only occasional reference has been made to this common species since it was first described, and a study of its development through the year has not been previously made. The present history was determined at Oak Harbor, Ohio, in 1928. Leng's Catalogue of the Coleoptera of North America gives its known distribution as Hudson Bay Territory, New Jersey, Colorado, California, and Indiana.

Morrill reports extensive defoliation of sage *Artemisia* sp. by this species on the Navajo Indian Reservation, but it was not of great importance. In all other reports it is cited as feeding upon goldenrod *Solidago* sp. on which the writer also observed it. According to Knight, the beetle is attacked by the Pentatomid predator *Perillus circumcintus.* The adult feigns death readily, dropping to the ground or lower parts of the plant when the latter is shaken or approached. Disturbances by wind tend to bring them lower on the plant than when the air is still. Parasites were not obtained during the present observations.

The Larval, Pupal, and Adult Stages.

The species seems to be best known in its larval stage. The larvae are black, with venters brown and when mature become about three-eighths inch long, and in regard to proportions and general appearance are similar to the larvae of the common

*Contribution No. 129 from the Entomological Laboratories of the University of Illinois.

asparagus beetle. They feed exposed on the leaves of *Solidago*, usually near the tops of the plants, on the more tender leaves, and sometimes consuming much of the foliage. They were seen in good numbers and well advanced in growth at Urbana on June 10, and mostly larger and also common on June 20 along the Toussaint River north of Oak Harbor. They are rather uniform in size, hence would seem to have begun development almost simultanously at the beginning of the season.

One hundred larvae placed in an insectary cage on June 21 has descended into the sandy soil by June 28, where they pupated in oval cases about one-half inch below the surface. Marcovitch, who saw the larvae abundant on the leaves in Minnesota in June, found them pupating in a breeding cage in early July, and just below the soil surface.

The pupa has the arrangement of appendages typical of coleopterous pupae. The color is yellowish, otherwise corresponding closely to the adult. The first adults made their appearance in the cage on July 12 and all had issued from their cells by July 18th. Marcovitch found that the pupal period was nine days, but the air was cool during the first part of July at Oak Harbor, and pupation required seventeen to twenty days. Emergence in nature probably continued to about August 1. Beetles in copulation and females in an extreme gravid state with abdomens swollen to two or three times their natural size were found from July, in the cages, to August 23 along the Toussaint River and at West Harbor at Catawba Island. Maximum numbers were present in about the third week of July, and mating, which is performed in the usual way of beetles, seemed to have reached its height about July 23. By August 23, the numbers had reduced to about one-fourth that of latter July, and on August 28 a few scattered individuals persisted. None was found in copulo on that date, although some females with enlarged abdomens were still present. Obviously then, a few adults survive the first of September; two were recovered in a cage on August 30. Blatchley reported it scarce in Lake and Marshall counties, Indiana, from July 4 to July 30.

Oviposition and the Egg.

Gravid females crawling about in a peculiar way over the *Solidago* in an observation cage were obviously seeking to oviposit. During locomotion the beetle constantly tapped the plant parts with the caudal end of her abdomen, or dragged the latter along and brushed it from side to side, thrusting it down into the fold of the leaves, into axils, and on plain leaf surfaces. A very definite form of situation is needed to satisfy the requirements of the beetle for oviposition. The selection is by a positive thigmotropism, the beetle backing its abdomen into various places until a suitably shaped spot is found. Locations chosen were depressions, folds, or concavities of nearly the conical shape and greatly distended size of the terminal third of the abdomen. The rounded surface of the leaf, or the rounded petiole, or branches, were never selected, even when the urge to oviposit was strong as evidenced by the persistent search of the female. The roughly conical places required were found under cage conditions both in and out of doors to be as follows; in the soil under the food plant, among small clods of earth; in folds of dried *Solidago* leaves on the ground, the folds formed by the spiral twisting of the leaves incident to drying; in only one instance were eggs found on a green leaf in a concavity caused by the feeding of a lace bug *Tingitidae;* into cavities, or between bark and pith, at the broken ends of old reed, or other stems, lying on the ground below the goldenrod. The stems of *Phragmites* are common under the *Solidago* along the river's edge, and in one instance eggs were found in the end of such a stem in a cage. The preferred places, judged by cage observations, were the soil and the dried leaves, the latter with petioles at times still clinging to the plant stems.

The eggs are deposited in irregular arrangement, consisting of masses of five to twenty-two eggs each. The eggs are cemented together, and the walls of the concavities are held to the eggs, by a small amount of a thin colorless liquid secreted by the female. Seven to ten minutes were spent in depositing some of the masses of eggs. During the most active oviposition there was a marked separation of the sexes on the plants,—the males being near or at the tops.

The egg: surface dull, color light brown to dim yellow; ovate in outline, one end obtusely, the other acutely rounded, shaped much like a turkey's egg; surface rough but not acutely or pitted, suggesting the exterior of a mulberry or morel mushroom; length 1-1.2 mm., maximum width 0.6-0.7 mm. slightly broader than thick, the shape being affected at times by the drying of the sticky secretion or of the leaves on which the eggs are deposited.

Both chorion and vitelline membrane, particularly the latter as this membrane goes, are thick and tough, and enclose a yellow yolk. These shells, together with the hidden positions of the eggs and their gluey covering, seem to protect the eggs well against dessication during the ten months of their existence. Feces were sometimes found covering in part the egg masses. The first eggs were laid, under observation, on July 23, and beetles caged outside on August 23 deposited several masses in the following week. The occurrence of gravid females in nature on August 28 indicates that oviposition may continue into September.

Generations and Hibernation.

On October 10, the eggs which were laid on the first date, and kept out of doors after deposition, were still firm and contained healthy yellow yolk with no traces of advanced embryonic development. Hence, the species without doubt spends the winter in the egg stage, and inasmuch as the larvae are well advanced in early June, hatching occurs about the middle of May. The eggs being in or near the ground, the larvae readily find the new food plants developing in the spring. There is thus only one generation a year, and the egg stage is longer than any other, approximately 10 months, from latter July to May.

In conclusion, two facts of general interest stand out in this history. The first is that there is only one generation annually whereas some other Chrysomelidae, *Diabrotica vittata* Fabr., for example, have two cycles during the same period of development. *T. canadensis* would seem to have sufficient time from latter July through August and September to produce a second generation. It is possible that the determining factor

here may be the timing of the larval stage with the existence of the tender growing period of the food plant. *Solidago* is in bloom and the foliage rather hard in August and September when the second cycle larvae would be present. Hence, there is probably an adaptation of the beetle cycle to that of the food plant. Britton's statement that the "plants *S. sempervirens* were stripped of their topmost leaves and tender shoots", whereas "the lower leaves were less injured and were still green", gives confirmation to this explanation.

The second point of interest is the discovery that the eggs of *T. canadensis* are placed in the soil or in folds of dry leaves on the ground rather than on the surfaces of green leaves that prevail at the time of oviposition and on which both larvae and adults feed. But the occurrence of only one generation per year explains this divergence in habit. The larvae, at the time of hatching, are more certain to be near their food plants in the next spring as a result of oviposition in the soil or on dry foliage on the ground than if the eggs were placed on green leaves which, upon drying, might easily be carried by the wind to some distance from the location of the next year's food plants with probably a higher consequent rate of mortality among the newly hatched larvae. The likelihood of being so removed is increased by the probability that the eggs, were they laid on green leaves, would quite likely be placed on the top of the plant on the more succulent foliage which winds would be more apt to carry away than the lower leaves which are sheltered from wind by the surrounding dense growth of goldenrod. This instance of the adjustment of the insect's oviposition habits seems to follow therefore its adaptation, by the number of generations, yearly, to the cycle of the food plant.

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Descriptions of Six New Species of Microphylellus (Hemip.: Miridae).*

By HARRY H. KNIGHT, Ames, Iowa.

Microphylellus adustus n. sp.

Pale yellowish and darkened with brownish and fuscous; rather suggestive of *Plagiognathus delicatus* Uhler but lacking the fuscous spots on femora and tibiae.

♀. Length 3.4 mm., width 1.3 mm. Head: width .696 mm., vertex .38 mm.; fuscous brown above, tylus blackish. Rostrum, length 1.12 mm., extending to near hind margins of middle coxae, yellowish, apex blackish. Antennae: segment I, length .21 mm.; II, .74 mm.; III, .41 mm.; IV, .36 mm.; dusky brown, last two segments more fuscous. Pronotum: length .52 mm., width at base 1.11 mm.

Clothed with simple, fine yellowish pubescence. Pale yellowish to brownish, more or less behind each callus, scutellum except for lighter streak each side of median line, inner half of clavus and inner half of corium, triangular central area of propleura, and sides of venter, dark brown to fuscous. Cuneus uniformly pale yellowish brown. Membrane rather uniformly fusco-brownish, but darker within areoles. Legs yellowish, apical half of femora, and the tibiae, dark brownish.

Holotype: ♀, August 11, 1925, Ute Creek Ranch, Ft. Garland, COLORADO (H. H. Knight); author's collection. *Paratypes*: 2 ♀, taken with the type. ♀ July 24, 1900, Salida, Colorado (E. D. Ball).

MICROPHYLELLUS ADUSTUS **binotatus** n. var.

Differs from *adustus* in the paler color and distinct black spots, one behind each callus; pale, tylus, vertex, spot behind each callus, lateral margins of scutellum, inner margin of clavus, inner half of corium, and the membrane fuscous to black. Sternum, propleura except margins, epimera, ostiolar peritreme, and venter, blackish.

♂. Length 3.7 mm., width 1.24 mm. Head: width .71 mm., vertex .326 mm. Rostrum, length 1 mm., reaching upon middle of intermediate coxae. Antennae: segment I, length .24 mm.; II, 1.03 mm., equal in thickness to segment I; III, .53 mm.; IV, .37 mm. Pronotum: length .50 mm., width at base 1.03 mm.

*Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

Holotype: ♂ June 29, 1927, Montesano, WASHINGTON (Wm. W. Baker); author's collection. *Paratypes*: 2 ♂, taken with the type. ♀ July 23, 1924, Saanich District; ♀ Sept. 8, 1922, Victoria, BRITISH COLUMBIA (W. Downes), "on cottonwood".

Microphylellus brevicornis n. sp.

Allied to *adustus* but smaller and of paler color; distinguished by the short second antennal segment which is not equal to width of head.

♀. Length 3.1 mm., width 1.3 mm. Head: width .66 mm., vertex .38 mm. Rostrum, length .47 mm., reaching to middle of intermediate coxae. Antennae: segment I, length .16 mm.; II, .61 mm., gradually thickened apically but not attaining thickness of segment I; III, .25 mm.; IV, .28 mm.; combined length of last two segments not equal to segment II. Pronotum: length .49 mm., width at base 1.08 mm.

Color pale, tinged with yellowish and dusky; apical half of clavus, inner half of corium, spot behind coxal cleft, more or less on sternum and sides of venter near base, dusky to fuscous. Clothed with short, fine, pale to yellowish pubescence, tibial spines yellowish brown. Membrane pale, dusky brown within and between areoles, also a small cloud just behind apex of areoles.

Holotype: ♀ April 20, 1926, Santa Cruz River, Pima Co., ARIZONA (A. A. Nichol); author's collection. *Paratypes*: 3 ♀, taken with the type on "cotton weed" by Mr. Nichol.

Microphylellus mineus n. sp.

Distinguished by the small size and light red color.

♀. Length 2.8 mm., width 1.23 mm. Head: width .62 mm., vertex .31 mm. Rostrum, length 1.09 mm., reaching to near hind margins of posterior coxae. Antennae: segment I, length .21 mm.; II, .68 mm.; III, .32 mm.; IV, .30 mm.; yellowish, last two segments dusky.

Color light reddish, scutellum, embolium, base and outer margin of cuneus, more yellowish. Legs pale to yellowish, tibial spines blackish. Tylus, lora, and tip of rostrum blackish. Membrane pale, anal area, within and between areoles, and more or less bordering apical margin of areoles, dusky to fuscous. Clothed with moderately prominent, simple, yellowish pubescence.

Holotype: ♀, Gainesville, FLORIDA (J. R. Watson); author's collection.

Microphylellus nicholi n. sp.

Allied to *bicinctus* Van D., but differs somewhat in color characters; hind femora blackish on distal half only, the pale band across clavus curving forward and involving basal one-fourth of corium.

♂. Length 3.3 mm., width 1.12 mm. Head: width .68 mm., vertex .266 mm. Rostrum, length 1.11 mm., reaching to middle of hind coxae, pale, segments one and four blackish. Antennae: segment I, length .19 mm.; II, .92 mm.; III, .55 mm.; IV, .31 mm.; yellowish, last two segments fuscous, segment II becoming dusky, darker apically. Pronotum: length .50 mm., width at base .98 mm.; lateral margins of disk sinuate sulcate, pale on middle third.

Color dark fuscous to black, basal one-third of cuneus white, an arcuate pale area across clavus behind scutellum, curving forward and involving the basal one-third of corium. Legs pale, distal half of hind femora blackish, hind tibiae and the tarsi fuscous. Tibial spines pale to brownish. Membrane rather uniformly dusky, darker along veins. Clothed with fine, recumbent, pale yellowish pubescence, becoming fuscous on dark part of cuneus.

♀. Length 2.8 mm., width 1.15 mm. Head: width .65 mm., vertex .33 mm. Antennae: segment I, length .18 mm., II, .70 mm.; III, .43 mm.; IV, .27 mm. Pronotum: length .47 mm., width at base .99 mm. Pubescence similar to the male but coloration much lighter; head black, pronotum yellowish, calli fuscous, propleura reddish; median line of scutellum yellowish, hemelytra more broadly pale than in the male, cuneus with basal half white. Venter reddish to brown; legs nearly as in the male.

Holotype: ♂ April 25, 1926, alt. 3200 ft., Santa Catalina Mts., ARIZONA (A. A. Nichol); author's collection. *Allotype*: taken with the type. *Paratypes*: 7 ♂ 12 ♀, taken with the types on *Quercus hypoleuca* by Mr. Nichol.

Microphylellus minor n. sp.

Very similar to *bicinctus* Van D., but size smaller, distinguished by the more porrect head, the tylus projecting distinctly forward, this difference more prominent in the female, the vertex also somewhat wider.

♂. Length 2.6 mm., width .95 mm. Head: width .61 mm., vertex .27 mm. Rostrum, length .93 mm., reaching to near hind margins of posterior coxae. Antennae: segment I, length .13 mm.; II, .65 mm.; III, broken; yellowish to dusky. Pronotum: length .38 mm., width at base .78 mm.

Color dark chestnut brown to blackish, basal one-third of cuneus white, a transverse pale band across clavus and corium beginning just behind scutellum; antennae and legs pale yellowish, hind femora chestnut brown except for pale base and apex. Pubescence pale to yellowish, tibial spines pale.

♀. Length 2.4 mm., width .95 mm. Head: width .59 mm., vertex .296 mm. Antennae: segment I, length .13 mm.; II, .58 mm.; III, .31 mm.; IV, .21 mm. Pronotum: length .37 mm., width at base .80 mm. Very similar to the male in coloration and pubescence.

Holotype: ♂ June 20, 1926, Fresno, CALIFORNIA (C. J. Drake); author's collection. *Allotype*: same data as the type. *Paratypes*: 4 ♀, taken with the types. Dr. Drake found this species on one host and *bicinctus* Van D. on a different host in the same locality, altho the plants were not identified. The small size of this species and the different host plant observed, indicates a biological difference between this and *bicinctus*, which taken with the differences noted in head, antennae and pubescence, further substantiates the view that we are dealing with distinct species.

Microphylellus flavicollis n. sp.

Allied to *bicinctus* Van D., but distinguished by the pale band across pronotum, by the broader head and distinctly tumid frons.

♀. Length 3.4 mm., width 1.36 mm. Head: width .78 mm., vertex .37 mm; vertex and frons strongly tumid, tylus slightly angulate, the apical half sloping posteriorly. Rostrum, length 1.24 mm., reaching to middle of hind coxae. Antennae: segment I, length .21 mm.; II, .83 mm.; III, broken; yellow. Pronotum: length .56 mm., width at base 1.14 mm.

Black, basal one-third of cuneus white; a transverse pale band across middle of clavus, more narrowly across corium and extending to include basal third of embolium; scutellum pale to yellowish, apex fuscous; pronotal disk with broad pale to yellowish band, leaving only narrow basal margin and the calli black, also extending over on the propleura. Legs pale yellowish, distal half of hind femora blackish. Membrane pale fuscous. Clothed with very fine pale to yellowish pubescence; tibial spines yellowish.

Holotype: ♀ May 10, 1926, Tampico, WASHINGTON (E. W. Davis); author's collection. ♀ May 15, 1911, Humboldt Co., CALIFORNIA (F. W. Nunenmacher). ♀ May 21, 1893, Hood River, OREGON.

Undescribed Species of Crane-flies from the Eastern United States and Canada (Dipt.: Tipulidae). Part V.

By CHARLES P. ALEXANDER, Massachusetts Agricultural College, Amherst, Massachusetts.

The novelties discussed in this installment were collected chiefly in Florida by my colleague, Professor J. Speed Rogers, of the University of Florida. A few additional species taken by myself in New York and New England are included. The striking new *Ulomorpha* from Florida is of especial interest.

Limonia (Limonia) **novae-angliae** n. sp.

General coloration yellow, the praescutum with narrow black stripes on the interspaces; knobs of halteres brownish black; femora yellow, the tips black, preceded by a clearer yellow ring; wings with three large brown areas in cell *R*, the second at the origin of *Rs*, the third at the stigma; R_2 subequal to R_{1+2}.

♂. Length about 7.5-8 mm.; wing 8-9 mm.

Rostrum and palpi black. Antennae with the scape brownish yellow, the flagellum black, with long verticils. Head brown above, obscure yellow beneath.

Pronotum dark brown, yellowish laterally. Mesonotal praescutum obscure brownish yellow, with four narrow black lines that margin the yellow stripes, the intermediate pair paler to subobsolete on the posterior half; lateral dark stripes crossing the suture onto the scutal lobes; scutellum pale; postnotal mediotergite chiefly pale, dark laterally. Pleura chiefly pale, variegated with small dark spots. Halteres yellow, the knobs brownish black. Legs with the coxae and trochanters yellow; femora yellow, the tips blackened, preceded by a slightly wider clearer yellow ring, with vague indications of a second dusky ring immediately proximad of this; tibiae yellow, the bases very narrowly, the tips more extensively blackened; tarsi black. Wings yellow, the costal region clearer; three conspicuous brown areas in the radial field, the first post-arcular, the second, roughly circular to subquadrate, at origin of *Rs*, the third area at stigma, almost entire; conspicuous and extensive greyish clouds in all cells beyond the stigma, the radial clouds interrupted by yellowish marks in the ends of the cells; cells *M*, *Cu* and the Anal cells more extensively variegated; veins dark brown, the costal and subcostal veins more yellowish. Venation: R_2 subequal to R_{1+2}; *m-cu* before the fork of *M*.

Abdomen brownish yellow, the basal rings of the tergites

somewhat clearer yellow; hypopygium obscure yellow. Male hypopygium with the dististyles separated only at tips. Gonapophyses slender, the apex with a microscopically spiculose cone, not with a tuft of setae as in *cinctipes* and allies.

Habitat. — MASSACHUSETTS. *Holotype*: ♂, Chesterfield Gorge, West Chesterfield, altitude 850 feet, August 2, 1928 (C. P. Alexander). *Paratopotype*, ♂. Type in the author's collection.

While this paper was going through the press, Mr. F. W. Edwards of the British Museum (Natural History) informs me that he collected a few additional specimens of the present species at Tuxedo Park, New York, August 27-28, 1928. Mr. Edwards notes that this was the commonest species of *Limonia* on the wing at that date.

Limonia novae-angliae is readily told from *L. cinctipes* (Say), to which it is apparently most closely allied, by its small size, darkened halteres and very distinct hypopygium. The wings of the types show abnormalities of venation, with adventitious crossveins and spurs, together with other malformations.

LIMONIA (Limonia) ROGERSIANA **longistylata** n. subsp.

♂. Length about 5.5 mm.; wing 6.2 mm.

Generally similar to typical *rogersiana* (Alexander) of the southeastern United States (Ent. News, 37: 45-46; 1926), differing especially in the larger size and details of structure of the male hypopygium.

Mesonotal praescutum with only the median praescutal stripe well-indicated. Wings with *Rs* longer and the basal section of R_4+_5 shorter, the former approximately three times the latter; *m* very long and arcuated, much exceeding the basal section of M_3. Male hypopygium with the basistyles very elongate, as in the group, the ventral-mesal lobe conspicuous, with elongate setae. Dististyle single, narrowed outwardly, at apex a slender chitinized spine. Apex of each gonapophysis microscopically serrulate, more distinctly so than in *rogersiana*.

Habitat.—FLORIDA. *Holotype*, ♂, "Camp Torreya", Liberty Co., April 26, 1924 (J. S. Rogers); No. 5. Type returned to Professor Rogers.

Although close to the typical form, *longistylata* certainly appears to be distinct, especially in the structure of the dististyles

of the male hypopygium. In *rogersiana,* the apex of the style is abruptly narrowed into a long, finger-like lobe, with two or three long setae close to the tip. The coloration of the allotype female of *rogersiana* is darker, with the three praescutal stripes better indicated, and this latter may be found to be a still different race or species. The present species belongs to a group that is well-developed in Tropical America (*basistylata* Alexander, *hoffmani* Alexander, *apicata* Alexander, and others).

Dactylolabis supernumeraria n. sp.

♂. Length about 7-8 mm.; wing 8-9 mm. ♀. Length about 8 mm.; wing about 8.5-9 mm.

Generally similar to *D. montana* (Osten Sacken), differing especially in the thoracic coloration and the venation.

Antennae a little longer, the outer flagellar segments correspondingly lengthened; antennae black, the basal segment a little pruinose. Head clearer grey. Mesonotal praescutum dark brownish grey, the four stripes poorly delimited against this background; in *montana,* yellowish grey, the stripes very conspicuous and well-defined. Pleura dark, pruinose, the pteropleurite paler. Wings with cell M_1 much longer than its petiole; cell *1st* M_2 long, exceeding M_3 beyond it; a supernumerary crossvein in cell R_3, opposite or just proximad of R_2.

Habitat.—New York, New England. *Holotype* ♂, Wilmington Notch, Adirondacks, NEW YORK, *June* 13, 1927 (C. P. Alexander). *Allotopotype,* ♀. *Paratopotype,* ♂. *Paratypes,* ♂ ♀, Smuggler's Notch, Green Mts., VERMONT, June 15-20, 1927 (C. P. Alexander). Type in the author's collection.

The specimens of *Dactylolabis montana* mentioned by Osten Sacken (Mon. Dipt. North America, 4: 228; 1869) as having adventitious crossveins in the submarginal cell presumably refer to the present species. The recently described *D. corsicana* Edwards (Corsica) similarly possesses a supernumerary crossvein in cell R_3 and Mr. Edwards tells me that the character was constant in the numerous specimens observed. Other species of the genus possess this character, but in some of the far northern species, as *D. rhicnoptiloides* Alexander, the crossvein tends to be evanescent. The present species was found commonly in the Green Mts., Vermont, and this feature of a supernumerary crossvein was quite constant.

Pilaria arguta n. sp.

Antennae (♂) short; mesonotal praescutum shiny brown, more yellowish laterally; wings relatively narrow, with a strong brownish suffusion; cell M_1 present.

♂. Length 7.2-7.5 mm.; wing 8-8.5 x 1.95-2 mm.

Rostrum obscure brownish yellow; palpi dark brown. Antennae (♂) short, if bent backward extending approximately to opposite wing-root; scapal segments obscure brownish yellow, the second darker at tip; flagellum brownish black, the verticils long and conspicuous. Head obscure reddish brown, the postgenae infuscated.

Mesonotal praescutum shiny yellow laterally, the disk behind more infuscated; posterior sclerites of mesonotum infumed. Pleura yellow. Halteres dirty white, the knobs darker. Legs with the coxae and trochanters yellow; remainder of legs yellowish brown, the terminal tarsal segments darker; basal setae of femora short and subspinous. Wings relatively narrow, with a strong brownish suffusion, the oval stigma a little darker than the ground-color; veins dark brown. Venation: Sc_1 ending about opposite three-fourths to four-fifths the length of the long *Rs*, Sc_2 at its tip; R_{2+3+4} subequal to or longer than R_3; R_2 just beyond the fork of R_{2+3+4}; cell M_1 subequal to its petiole; *m-cu* at or beyond midlength of cell *1st* M_2.

Abdomen obscure yellowish brown, fringed laterally with conspicuous setae.

Habitat.—FLORIDA. *Holotype*: ♂, Newman's Lake, Alachua Co., April 6, 1928 (J. S. Rogers); No. 230. *Paratype*, ♂, Marianna, Jackson Co., April 13, 1928 (J. S. Rogers); No. 3. Type returned to Professor Rogers.

Pilaria arguta is allied to *P. recondita* (Osten Sacken), differing especially in the smaller size and narrow wings.

Pilaria vermontana n. sp.

General coloration brown; antennae of moderate length in both sexes, in the male extending approximately to the base of the abdomen; wings with a pale brown tinge, the relatively small oval stigma only a little darker; cell M_1 present.

♂. Length about 7.5-8.5 mm.; wing 8-9 mm.

♀. Length about 8 mm.; wing 9.5 mm.

Rostrum and palpi dark brown. Antennae dark brown, of moderate length, in male if bent backward extending approximately to the base of the abdomen; flagellar segments cylindrical, with verticils that are shorter than the segments. Head dark greyish brown.

Mesonotum pale testaceous brown, the posterior sclerites darker brown. Pleura more yellowish than the notum. Halteres pale, the base of the stem restrictedly yellow. Legs with the coxae and trochanters yellow; femora brownish testaceous, the tips darkened; tibiae and tarsi passing into darker brown. Wings with a pale brown tinge, the relatively small oval stigma hairy, only a little darker than the ground-color; veins dark brown. Venation: Sc_1 a short distance before the fork of *Rs*, Sc_2 at its tip; *Rs* elongate, gently arcuated at origin; R_2 oblique, at fork of R_3+_4; cell M_1 present, varying from subequal to much longer than its petiole; *m-cu* at or shortly beyond mid-length cell *1st* M_2. Wings broader than in *tenuipes*.

Abdominal tergites dark brown, the sternites somewhat paler; hypopygium obscure yellow.

Habitat.—VERMONT. *Holotype*: ♂, Woodcrest Farm, near Stowe, at foot of Mt. Mansfield, in a sphagnum bog, altitude 1000 feet, June 22, 1927 (C. P. Alexander). *Allotopotype*: ♀, June 22, 1927. *Paratopotype*: ♂, June 24, 1927. Type in the author's collection.

Pilaria vermontana is somewhat intermediate in its characters between *P. tenuipes* (Say) and *P. recondita* (Osten Sacken). The antennae are conspicuously shorter than in *tenuipes* but much longer than in *recondita* and allies. It is probable that the present species, like *P. stanwoodae* (Alexander), will be found to be confined to the vicinity of bogs.

Ulomorpha rogersella n. sp.

General coloration shiny coal-black, the ventral pleurites reddish yellow; fore femora extensively blackened, the remaining femora yellow; wings yellowish, the veins broadly seamed with darker; cell M_1 lacking.

♂. Length about 5.5 mm.; wing 6 mm.

♀. Length about 8 mm.; wing about 7.5 mm.

Rostrum and palpi black. Antennae black throughout, the verticils elongate. Head shiny black.

Mesonotum shiny coal-black. Pleura black, the ventral sternopleurite and meron pale reddish yellow, with a microscopic appressed silvery pubescence. Halteres pale brownish yellow, in the female the knobs more infuscated. Legs with the coxae and trochanters obscure yellow; fore femora with the distal two-thirds black, the base light yellow, the segment weakly clavate; remaining femora obscure yellow, the base a trifle clearer; tibiae and tarsi pale yellowish brown, the distal tarsal

segments infuscated; legs conspicuously hairy. Wings with a yellowish ground-color, the veins broadly seamed with brownish to produce a more or less distinct streaked appearance; stigma oval, a trifle darker than the brown seams; veins brown. Macrotrichiae of the cells abundant, including all cells beyond cord, as well as the distal ends of cells *R, M, Cu* and *1st A*. Venation: Sc_2 at tip of Sc_1, ending about opposite two-thirds to three-fourths the length of *Rs; Rs* relatively long, strongly arcuated to angulated and short-spurred at origin; cell R_3 sessile; cell M_1 lacking; cell *1st* M_2 elongate-rectangular, *m-cu* at near two-fifths its length.

Abdomen shiny coal-black, the intermediate sternites a little brightened. Ovipositor with the tergal valves long and slender, pale horn-yellow, gently upcurved.

Habitat.—FLORIDA. *Holotype*: ♂, Marianna, Jackson Co., April 13, 1928 (J. S. Rogers); No. 847, study-specimen. *Allotopotype*: ♀. *Paratopotype*: ♂, No. 3. Type returned to Professor Rogers.

Ulomorpha rogersella is very distinct from the only other known Eastern species, *U. pilosella* Osten Sacken. It is named in honor of the collector, Professor J. Speed Rogers, who has done more than any other person to make known the Tipulid fauna of the southeastern United States.

Dasychernes inquilinus from the Nest of Meliponine Bees in Colombia (Arachnida: Chelonethida).

By JOSEPH CONRAD CHAMBERLIN, Stanford University, California.

Through the courtesy of Mr. George Salt of Bussey Institution of Harvard University, I have had the privilege of examining an interesting collection of false scorpions taken at two localities in Colombia from the nesting cavities of Meliponine bees. This magnificent form (it is one of the largest of the false scorpions) hitherto undescribed is here named *Dasychernes inquilinus,* genus et species nova. It is assigned to the family CHELIFERIDAE Hagen and to the subfamily CHELIFERINAE Simon.

DASYCHERNES nov. gen.

Orthotype: *Dasychernes inquilinus* n. sp. Colombia.

Diagnosis: Cheliferoid genus related to *Chernes* and *Chelanops.* Sclerotic parts obscurely granulate, almost smooth but

scarcely polished. Setae simple and slender, non-denticulate. Venom apparatus reduced and present in movable finger only. Chela with accessory teeth serially developed exteriorly and interiorly on both fixed and movable fingers. Fingers of chela with sense spot areas tremendously developed, primarily basally on exterior and interior surfaces of both fixed and movable fingers. Fingers of chela in female slightly gaping when closed; widely gaping in male. Chaetotaxy of chela: movable finger—terminal seta about one-third finger length from tip of finger; sub-terminal seta one-eighth to one-ninth finger length from terminal seta; sub-basal seta about one-fifth finger length from base with the basal seta midway between it and base of finger; fixed finger—exterior terminal seta one-eighth finger length from tip; exterior sub-terminal seta between 3 and 4 eighths of a finger length posterior to the exterior terminal seta; interior terminal seta dorsal and one-third closer to exterior terminal seta than exterior sub-terminal seta; exterior basal seta almost truly basal; exterior sub-basal seta dorso-anterior thereto a distance equal to that between the basal and sub-basal setae; interior basal seta dorsal, slightly anterior to the exterior sub-basal seta; interior sub-basal seta dorsal, nearly midway between the interior sub-terminal and the interior basal setae, situated clearly on basal half of finger. Flagellum of three blades. Spinneret galeate, multi-ramose and not sexually differentiated.

Palm of chelicera with seven (two accessory) setae, of which the central group of three are terminally, minutely denticulate. Carapace garypoid in form, totally eyeless and with two strongly developed transverse carapacal furrows of which the anterior one is slightly posterior of median and procurved; the posterior one nearer posterior carapacal margin than anterior furrow and weakly recurved. Tracheal trunks with numerous, internal, finger-like papillae. Leg IV without differentiated tactile setae but with a tarsal sense dome one-third to one-fourth from base. Tarsal claws partially retractile against the excavated tip of tarsus; claws and subterminal setae simple; empodium normal in form and shorter than claws. Clothing setae normal on palps and nearly so on carapace and legs; tergites and sternites distinctly hairy especially laterally and posteriorly; setae not arranged in rows as usual but more or less evenly distributed over the entire tergal scutae and over the posterior half of the sternal scutae; in the orthotype a median tergite (compounded of 2 scutae) bears well over 200 setae while a similar sternite bears in the neighborhood of 100. All tergites and sternites but the first and eleventh divided by a

median membranous area which is broadest medianally; intersegmental membrane broad and plicate; pleural membrane broad and prominently papillate.

Remarks. The hairy tergites will distinguish this genus from all related groups. Known only from the orothotype.

Dasychernes inquilinus n. sp.

Large species measuring between 5 and 6 millimeters long when expanded. Femur shorter than carapace; fingers of chela longer than femur; tibia shorter than femur; fingers much longer than hand which is clearly longer than broad. Trochanter 1.7 to 1.8 times as long as broad; femur 2.7 to 2.9 times as long as broad, slenderest in male; tibia 2.5 to 2.8 times as long as broad, slenderest in male; chela 3.3 to 3.7 times as long as broad, also slenderest in male; hand slightly broader than deep but almost cylindrical; fingers 1.3 to 1.6 times as long as hand, more elongate in male. Spinneret (galea) scarcely twice as long as basally broad, strongly conical in shape and with many short simple branches. Chela with a band of densely packed sense spots extending from base to beyond midpoint on exterior surface of both fixed and movable fingers; fixed finger with a large basal area and an attenuated zone of sense spots extending to middle of finger or beyond; interior surface of fixed finger with a large basal area of sense spots from which extends a scattered zone to beyond middle of finger; interior surface of movable finger with a close basal cluster and ill-defined projecting zone of scattered sense spots extending to beyond middle of finger. Nodus ramosus opposite 27th to 30th marginal tooth. Fixed finger with a series of 12-18 accessory teeth on either side of marginal row; movable finger similarly, with 10-16 teeth on either side of marginal series.

Holotype, ♂ (JC—439.01002); *Allotype,* ♀, (JC—439.01,-001). Paratypes, 10 ♂, and 8 ♀, (JC—439.01003 to 21). Also 9 immature specimens (JC—439.01022 to 29). All from Rio Frio, COLOMBIA. Collected by George Salt, October 11, 1927. Additional material (Paratypes) 6♀, 1 ♂ (JC—442.01001-8), from Sevilla, Colombia. Coll. George Salt, July 30, 1927. All material except 2 ♀, (JC—442.01002 and 3) from Sevilla, and 2 ♂, and 2 ♀, (JC—439.01004 to 7) from Rio Frio, in author's collection. The excepted specimens have been returned to Mr. Salt.

Transient Color Changes in the Tortoise Beetles[1] (Coleop.: Chrysomelidae).

By CLYDE W. MASON, Laboratory of Chemical Microscopy, Department of Chemistry, Cornell University, Ithaca, New York.

As entomologists have known for years, specimens of the common "tortoise beetles," *Coptocycla bicolor* Fabr. and *C. signifera* Herbst, lose their brass-yellow metallic iridescence soon after death, becoming a pale brown. It is perhaps not so generally known that they may lose it temporarily when alive, or may vary its hue in a most striking manner. Such unusual behavior affords an excellent opportunity to apply the thin-film theory of structural colors in insect integuments, which has been discussed by the writer in a series of earlier papers.[2]

This theory is supported by a wide variety of evidence from numerous workers. It explains the production of brilliant colors which change their hue with changing angle of observation, and which show almost metallic luster without the presence of any but neutral-hued pigments, as being due to purely structural causes. The color production is ascribed to films of transparent chitinous material which are themselves colorless, and which produce color by virtue of their extreme thinness, just as does a soap bubble or an oil film on water. The colors are more brilliant and metallic than those of soap bubbles because several films function to produce them. These films are less than 0.5 micron thick, and are in contact except for cementing layers of slightly different chitinous material. The entire color-producing layer may be no more than a micron or two in thickness.

COLOR PHENOMENA OBSERVED.

The appearance of the living, undisturbed beetle is almost like a ball of gold. Its elytra are highly metallic, and their bright brass-yellow color makes the insect conspicuous in sunshine. The reflections are specular and the high lights sharply

[1]This paper is a continuation of an investigation supported by a grant from the Heckscher Foundation for the Advancement of Research, established by August Heckscher at Cornell University.

The writer is indebted to Dr. W. T. M. Forbes, of the Department of Entomology, for advice and criticism in connection with this study.

[2]Mason: Structural Colors in Insects, J. Phys. Chem. *30*, 383-95 (1926); *31*, 321-54, 1856-72. Structural Colors in Feathers, J. Phys. Chem. *27*, 201-251, (1927), 401-447 (1923).

defined, as with metals. If the line of vision is inclined to the surface the color is not yellow but green, or even blue at grazing incidence. This color change with increasing angle of vision corresponds exactly to that of numerous other iridescent insects, and is typical of thin-film colors. It represents a shift in Newton's series of colors,[1] from upper second order to lower second order. A similar decrease in order is noted at the edges of the elytra or of pits in the integument, and corresponds to a *thinned* color-producing structure. The slight localized non-uniformities of hue visible microscopically are due to unevenness in the thickness of the films.

The color originates beneath the outer hard transparent layer of the elytron, as may be shown by scraping the latter; it is above the fluid interior however, and is backed by the orange color of the latter. Scrapings may be removed, or torn edges studied, and their properties are wholly consistent with those anticipated from the thin-film theory.

When the insect is disturbed, in the course of less than a minute its color changes progressively through the hues of lower order in Newton's series, becoming green, blue, violet, and finally a brownish orange which is lost against the color of the fluid interior of the elytron. The metallic lustre and brilliancy of the color seem to decrease, but this is probably because blue and violet are less bright to the human eye than is yellow.

This shift in hue from golden yellow to dark purple or orange may serve as a protective device, for certainly the beetles are less easily noticed when they have changed to their less gorgeous hues. If the insect is left undisturbed for a few minutes, the colors pass through the above sequence in reverse order until the original hue is regained.

One might perhaps postulate that these changes involve the rapid, reversible, syntheses of a series of different colored pigments, or at least the presence of a pigment which can show

[1]Colored charts of the series of interference colors such as are produced by thin films may be found in the following books:
C. V. Boys, Soap Bubbles (1912)
Johannsen: Determination of Rock Forming Minerals (1908)
Iddings: Rock Minerals (1911)
Winchell: Elements of Optical Mineralogy (1909).
Or one can produce the colors for himself by allowing a drop of oil to spread on water over a dark background. At the edges, where the film is thin, the colors are of low order, and their order increases toward the thicker center of the film.

several colors, as an indicator does with acids and alkalies. But in addition such a pigment would have to exhibit a high degree of "selective reflection" and still be almost colorless by transmitted light. We know of no pigments or other colored substances which even approximate these properties.

On the other hand, all of the remarkable color phenomena which the tortoise beetles show can be easily explained by the thin-film theory. The brilliancy of metallic lustre of the coloring are perfectly analogous to those of thin films, and the hues are identical with those of Newton's series. The faint transmission colors, complementary to the reflection colors, are also consistent. The changes of color with changes in the angle of incidence are exactly what one would predict. In all the above respects the tortoise beetles do not differ from other insects having metallic iridescent integuments.

As regards their unique behavior in changing their hue when disturbed, one naturally assumes that in some way they are able to vary the thickness of the color producing films. As confirmation of this idea, we note that the change in hue corresponds precisely to that produced when a color producing film is made thinner. The colors pass from upper second order green, through the lower second order of Newton's series, to upper first order violet or orange. As the insect recovers its composure the reverse changes are again in perfect agreement with those which we would expect if a color-producing film were thickened.

We can test this explanation further by subjecting scrapings of the iridescent layer of the integument to pressure, so as to make the films thinner. The colors change just as described above. When pressure is removed, they are restored, similarly.

In attempting to test the insect's control over its color, an elytron was cut transversely by fine scissors, so that only the inner edge remained intact. It was found that the power of color variation did not extend beyond the cut. But more important, the vicinity of the cut showed a pronounced alteration in color, as compared with the remainder of the elytron.

The uninjured portion of the surface becomes violet of the lower second order, due to the disturbance of the insect by the operation. Toward the cut, the colors rise in order, up to yellow of the second order, or even as high as the red between the second and third orders. Still nearer the cut the colors de-

crease in order, down through the second order to the lowest violet or orange which is ever perceptible on the insect. The zone of higher order colors parallels the cut and follows any angles which it may make. The color producing layer may show a distinctly wrinkled surface in the region of highest order color.

Such behavior makes impossible demands upon any pigmentation theory, but can be explained rather simply as due to a localized "congestion" in the vicinity of the injury, which results in a swelling of the color films. This is confirmed by the wrinkled appearance developed. At the very edges of the cut, where the tissue is actually laid open, evaporation of moisture, and consequent shrinkage, cause a lowering of the color.

This swelling and shrinking of the color-producing film, with corresponding changes in its thickness, is also the explanation of the color changes shown by the living insect. By a slight regulation of the turgor of the tissue in which the color originates, probably by regulation of its moisture content, the insect can produce a wide variety of colors. Instead of growing pale with fright, by the contraction of the capillaries of the skin, the tortoise beetle becomes a lower order color, by the shrinkage of his color-producing membrane. The study of the deeper physiological and psychological aspects of this manifestation of insect emotion the writer is forced to leave to the entomologist.

One might carry the absurd comparison a step further by saying that superficial injuries, instead of causing swelling and redness from congestion of blood, bring about swelling and high order colors from the increased thickness of the color film.

To test this explanation, attempts were made to swell and to shrink the color-producing membrane. It was laid bare, either by scraping or by cutting through the elytron, and wetted with water. Instead of lowered colors at the very edge of the exposed part, the colors were even higher than in the adjacent zone. The color-producing tissue was strongly wrinkled, and obviously had undergone swelling where the water had soaked into it. On drying out the colors decreased in order to the original

hues. This points to the color-producing films being made up of a tissue capable of variable degree of hydration and consequent swelling, such as is common in all forms of life.

As a further test, a specimen which had been swelled with water in the manner just described was wetted with a concentrated solution of sodium chloride. Just as in the familiar experiments with plant and animal cells, the salt solution, of high osmotic pressure (hypertonic), abstracted water from the tissue, resulting in a marked shrinkage which was evidenced by a smoothing out of the wrinkles, and by a lowering of the order of the colors. Replacing the salt solution by water restored the previous swollen condition.

In the light of the above observations it seems reasonably certain that the loss of color after death is due to similar causes. Drying out of the tissue causes a thinning of the color film, a lowering of the colors, and finally the loss of iridescence and lustre, just as when drying out occurs at the edge of a cut. However, if the insect is killed by drowning, or is kept moist after death, the colors may last for months, and would probably be permanent if the specimen were preserved in an appropriate isotonic "physiological saline solution." Specimens which have been dry and colorless for some months may have their color and lustre restored more or less perfectly by soaking in water. This is not always successful, probably because the tissue may have been so completely coagulated and hardened as to be practically unsusceptible to the swelling action of water. It might be of interest for an entomologist with plenty of material to apply the explanation given above to working out a method of retaining the fugitive coloring of the tortoise beetles (and possibly other insects) by the use of isotonic solutions which will keep the tissue in its original condition, with neither swelling, shrinkage, decay or loss of differentiated character.

Conclusions.

The conclusions of this paper are as follows:

1. The "tortoise beetle" changes its color when disturbed, by altering the thickness of the films which constitute its color-producing layer.

2. The loss of color in dead specimens is due to a dehydration and shrinkage of the tissues, which is not perfectly reversible.

ENTOMOLOGICAL NEWS

PHILADELPHIA, PA., FEBRUARY, 1929.

Entomology at the "Convocation Week" Meetings, December 27, 1928, to January 2, 1929.

Again we summarize the papers treating of insects and a few other tracheate arthropods listed on the program of the (eighty-fifth) meeting of the American Association for the Advancement of Science and Associated Societies, held in New York City. As heretofore, we do not attempt to differentiate between papers actually delivered and those not given, due to the absence of their authors. The summary at least gives information as to the topics being studied at this time.

The numbers of papers listed by the various societies were as follows:

Entomological Society of America	34
American Association of Economic Entomologists	115
American Society of Zoologists alone	12
Same, Joint Genetics Section	12
Ecological Society of America	2
American Society of Parasitologists	4
Botanical Society of America	2
Total	181

These papers were distributed in subject as follows:

General Entomology	4	General Economic Entomology	13
History of Entomology	4	Insecticides and Appliances	31
Teaching Entomology	2	Apiculture	10
Collecting Methods	3	Affecting Cereal, Forage and Field Crops	15
Cytology	2	Do. Truck Crops	12
Anatomy	5	Do. Greenhouse Plants	2
Physiology	29	Do. Fruits and Fruit-trees	32
Ecology	16	Do. Household and Stored Products	1
Geographical Distribution	5	Do. Forest and Shade Trees	4
Ontogeny	5	Carrying Plant Disease Germs	1
Genetics	11		
Parasites of Insects	5		
Affecting Man and other Animals	4		
Taxonomy	9		

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Orthoptera	5
Isoptera	1
Plecoptera	1
Ephemerida	1
Homoptera	16
Thysanoptera	1
Coleoptera (excl. Japanese beetle)	19
Japanese beetle	8
Hymenoptera (excl. *Apis*)	7
Apis	4
Lepidoptera (excl. codling and oriental peach moths and corn borer)	6
Codling moth	12
Oriental peach moth	6
Corn borer	6
Trichoptera	1
Diptera (excl. *Drosophila*)	14
Drosophila	8
Araneina	1
Acarina	1

Many of these figures are duplicated, both between sections i and ii and also within each section.

The total of 181 papers exceeds any of those of the preceding five years, beginning with 1923-24, as follows: 180, 166, 158, 167, 178. The numbers given on the programs for the same five years were, for the Entomological Society of America: 70 (41 of which comprised the symposium), 38 (9 of them jointly with the Ecol. Soc. Amer.), 34 (7 of them with the Assn. Econ. Ent.), 38, 31; for the American Association of Economic Entomologists: 89, 93, 83 (see above), 102, 111; for the American Society of Zoologists, both alone and jointly: 18, 17, 21*, 19, 15. Papers on Physiology, Insecticides, Insects affecting Fruits and Fruit trees and on *Drosophila* exceed in number those of any of the preceding five meetings.

The Entomological Society of America, Prof. E. O. Essig, *president,* Prof. J. J. Davis, *secretary,* met Dec. 27 and 28, the annual public address on "The Potentialities of Entomology" by Dr. R. N. Chapman, of the University of Minnesota, being given on Dec. 28 at 8 P. M. The American Association of Economic Entomologists, Prof. W. B. Hermes, *president,* Mr. C. W. Collins, *secretary,* met Dec. 27-31, including its sections of Plant Quarantine and Inspection and of Apiculture. The annual address of the president, "The Experimental Method as Applied to Entomological Investigations" was delivered on the morning of the 28th. Both societies met in Teachers' College of Columbia University. The "Dinner of Pure and Applied Entomologists" was held in the Flying Bird Gallery of

*Including Section F, A. A. A. S. and its joint meetings—Ent. News, xxxvii: 54.

the American Museum of Natural History, Dec. 29, at 5.30 p. m., Prof. W. M. Wheeler presiding.

An "At Home" for entomologists was arranged for the afternoon of Dec. 30 at the Museum, followed by an informal reception at the home of Mr. and Mrs. John D. Sherman, Jr., at Mount Vernon, New York. To them, to Dr. F. E. Lutz and his associates on the local committees of arrangements, we, who attended all or some of these meetings and gatherings, are deeply grateful for a cordial welcome and pleasant and valuable interchange of ideas and of greetings.

Articles on Museums Containing Lepidoptera.

Thanks to the generosity of Mr. J. D. Gunder, of Pasadena, California, the News will be able to present to its readers, from time to time, some additional pages and some illustrations showing museums in North America containing important collections of Lepidoptera and portraits of entomologists active in those institutions.

Entomological Literature

COMPILED, WITH THE ASSISTANCE OF "BIOLOGICAL ABSTRACTS," UNDER THE SUPERVISION OF E. T. CRESSON, JR.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

The numbers **within brackets** [ ] refer to the journals, as numbered in the list of Periodicals and Serials published in the January and June numbers (or which may be secured from the publisher of Entomological News for 10c), in which the paper appeared. The number of, or annual **volume,** and in some cases the part, heft, &c. the latter **within** ( ) follows; then the pagination follows the **colon** :

All continued papers, with few exceptions, are recorded only at their first installments.

*Papers containing new forms or names have an * preceding the author's name.

(S) Papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

☞ *Note the change in the method of citing the bibliographical references, as explained above.*

Papers published in the Entomological News are not listed.

GENERAL.—Christie, J. R.—Notes on larval nemas from insects. [Jour. Parasitology] 15: 127-130, ill. **Cockerel, T. D. A.**—What is a hybrid? [31] 122: 845. **Ehrenberg, K.** — Ueber Standortsformen. [Verh. Zool.-Bot.

Gesell. Wien] 78: 53-59. **Horn & Schenkling.**—Index literaturae entomologicae. Leconte-Schaum. 3: 705-1056. **Knight. P.**—The development and present status of entomological courses in American colleges and universities. [12] 21: 871-877, ill. **Lambrecht. K.**—Die verwendung der fluorographie in der paläontologischen forschung. [Verh. Zool.-Bot. Gesell. Wien] 78: 62-70, ill. **Merle, R.**—Les insectes prédateurs du Chili. [La Nat.] 1928: 502-506, ill. **Ogilvie, L.**—The insects of Bermuda. [Bermuda Dept. Agric.] 1928: 3-52, ill. **Roig, M. S.**—Catalogue of natural history specimens in the Museum of Natural History of Havana, Cuba. [Inst. Nac. Investigacions Cien. Mus. Hist. Nat. Cuba] 1928: 9-220, ill. **Stiles & Hassall.**—Key-catalogue of insects of importance in public health. [U. S. Hyg. Lab. Bull.] 150: 291-408. **Sweetman, H. L.**—Notes on insects inhabiting the roots of weeds. [7] 21: 594-600.

ANATOMY, PHYSIOLOGY, ETC.—Boulangé, H. —Sur le déterminisme du fouissement chez la larve de Naurotoma flaviventris. (Tenthredinidae) [25] 1928: 254-259. **Despax, R.**—A propos de l'action de la lumière sur la métamorphose des Trichoptères. [25] 1928: 244-247. **Fasten, N.**—Concerning cilia in the Arthropoda. [7] 21: 670. **Friedmann, H.**—Social parasitism in birds. [73] 3: 554-569. **Fulton, B. B.**—Some temperature relations of Melanotus (Elateridae). [12] 21: 889-897, ill. **Geist, R. M.**—The heat sensitive areas of certain grasshoppers. [7] 21: 614-618. **Hiestand, W. A.**—A correlation of strength and weight in insects. [7] 21: 601-606, ill. **McIndoo, N. E.**—Responses of insects to smell and taste and their value in control. [12] 21: 903-913. **Mordvilko, A.**—The evolution of cycles and the origin of heteroecy (migrations) in plant-lice. [75] 2: 570-582. **Morgan & Crumb.**—Notes on the chemotropic responses of certain insects. [12] 21: 913-920. **Robinson, W.**—Water conservation in insects. [12] 21: 897-902, ill. **Sayle, M. H.**—The metabolism of insects. [73] 3: 542-553, ill. **Snodgrass, R. E.**—Morphology and evolution of the insect head and its appendages. [Smiths. Misc. Coll.] 81: 1-158, ill. **Stahn, I.**—Ueber die atmungsregulation, besonders die kohlensäureregulation, bei Dixippus morosus und Aeschna grandis. [89] 46: 1-85, ill. **Timon-David, J.**—Sur les variations des graisses de réserve pendant l'evolution de la Pyrale du Maïs (Pyrausta nubilalis). [77] 99: 1799-1800. **van Bemmelen, J. F.**—Die farbenzeichnung von raupe, puppe und imago und ihre beziehungen zur erblichkeitslehre. [34] 3 Suppl. Band: 169-183, ill.

ARACHNIDA AND MYRIOPODA.—*Leitão, M. — Opiliões de Matto-Grosso e Pernambuco. [32] 4: 9-13, ill. ***Worley, L. G.**—New Nebraska spiders. [7] 21: 619-622, ill.

THE SMALLER ORDERS OF INSECTS.—Claassen, P. W.—Additions and corrections to the monograph on the Plecoptera of North America. [7] 21: 667-668. **Spencer, G. J.**—External parasites on certain birds of British Columbia. [4] 60: 257-260.

ORTHOPTERA.—Hubbell & Walker.—A new shrub-inhabiting species of Schistocerca from Central Florida. [Occ. Pap. Mus. Zoll. Univ. Michigan] 1928: 1-10, ill. **Kuhl, W.**—Die variabilität der abdominalen korperanhänge von Forficula auricularia unter berucksichtigung ihrer normalen und abnorman entwicklung, nebst einem anhang über die geschlechtsbiologie. [46] 12: 299-532, ill.

HEMIPTERA.—Esaki & China.—A monograph of the Helotrephidae, subfamily Helotrephinae (Heteroptera). [EOS] 4: 129-172, ill. ***Granovsky, A. A.**—A review of Myzocallis species inhabiting Alnus, with description of a new species (Aphiidae). [7] 21: 546-565, ill. ***Harris, H. M.**—A monographic study of the hemipterous family Nabidae as it occurs in North America. [70] 9: 1-97, ill. ***Hoke, G.**—Some undescribed Diaspines from Mississippi, II. (Coccidae.) [7] 21: 671-676, ill. **Jaczewski, T.**—Bemerkungen über die geographische verbreitung der Corixiden. [An. Mus. Zool. Polonici] 7: 45-67. ***McAtee & Malloch.**—Thyreocorinae from the State of Paranà, Brazil. [An. Mus. Zool. Polonici] 7: 32-43.

LEPIDOPTERA.—*Hall, A.—A revision of the genus Phyciodes (Nymphalidae). [Suppl. Bull. Hill Mus.] 2: 25-44, cont. ***McDunnough, J.**—Notes on Canadian diurnal Lepidoptera. [4] 60: 266-275. ***Meyrick, E.**—Exotic Microlepidoptera. 3: 417-448. **Ripper, W.**—Ueber die systematische bedeutung der stellung der primären borsten bei Lepidopterenlarven. [Verh. Zool.-Bot. Gesell. Wien] 78: 76-80. ***Talbot, G.**—List of Rhopalocera collected by Mr. C. L. Collenette in Matto Grosso, Brazil. [Bull. Hill Mus.] 2: 192-223, ill. ***Talbot, G.**—List of Arctiidae and Amatidae collected by C. L. Collenette in Matto Grosso, Brazil. With descriptions of some new forms. [Bull. Hill Mus.] 2: 241-246.

COLEOPTERA.—Cros, A.—Révision des genres Horia et Cissites. (Note rectificative et complementaire.) [Bull. Soc. R. Ent. Egypte] 11: 103-115, ill. **Dury, C.**—Blaps mucronata in Cincinnati, O. [19] 23: 180. **Gentner, L. G.**—The systematic status of the mint flea beetle (Chrysom.) with additional notes. [4] 60: 264-266. **Hatch, M. H.**—Notes on the classification of Nearctic Coleoptera. [7] 21: 571-580, ill. **Hatch, M. H.**—Studies on the carrion beetles of Minnesota, including new species. [Univ. Minn. Agric. Exper. Sta.] 1927: 3-19. ***Kleine, R.**—Eine neue Brenthide aus Peru [Senckenbergiana] 10: 226, ill. ***Leuderwaldt, H.**—Novas especies do genero "Pinotus" (Lamell.). (S). [32] 4: 63-65. **Marriner, T. F.**—Coccinellid hybrids. A provoked communication. [21] 40: 176-177. **Saunders, L. G.**—(See under Diptera.) ***Van Dyke, E. C.**—A reclassification of the genera of North American Meloidae and a revision of the genera and species formerly placed in the tribe Meloini, found in America north of Mexico, together with descriptions of new species. [67] 4: 395-474, ill.

DIPTERA.—*Aldrich, J. M.—New Diptera or two-winged flies from South America. [50] 74: 1-25, ill. ***Alexander, C. P.**—New species of crane-flies from South America. Part II. (Tipulidae.) [7] 21: 623-641. **Blunk, Bremer & Kaufmann.**—Untersuchungen zur lebensgeschichte und bekampfung der Rübenfliege (Pegomyia hyoscyami). [Arb. aus der Biol. Reich. für Land-und Forstwirtschaft] 16: 423-573, ill. **Branch, H. E.**—Description and identification of some chironomid egg masses. [7] 21: 566-570, ill. ***Bromley, S. W.**—New neotropical Erax in the American Museum of Natural History (Asilidae). [40] 1928: 1-5. **Clausen, C. P.**—Hyperalonia oenomaus, a parasite of Tiphia larvae (Bombyliidae). [7] 21: 642-659, ill. ***Curran, C. H.**—New Diptera in the American Museum of Natural History. [40] 1929: 1-13, ill. ***Curran, C. H.**—New species of Ommatius from America, with key. (Asilidae) [40] 1928: 1-6. ***Curran, C. H.**—Revision of the American species of Archytas. (Tachinidae.) [40] 60: 275-282, ill. **deMeijere, J. C. H.**—Die larven der Agromyzinen. [Tijd. Ent.] 71: 145-178, ill. **Edwards, F. W.**—A note on Telmatogeton and related genera (Chironomidae). [56] 7: 234-237. ***Engel, E. O.**—Die ausbeute der deutschen Chaco-Expedition. V. Empididae. (S). [56] 7: 245-251, ill. **Hendel, F.**—Ueber zwei

meiner dipterengattungen, die Doktor J. M. Aldrich nicht anerkennen will. [56] 7: 214-217. **Hendel, F.**—Zweiflügler oder Diptera. [Tierwelt Deutschlands] 11« 1-135, ill. **Holmquist, A. M.**—Notes on the biology of the muscid fly, Pyrellia serena, with special reference to its hibernation. [7] 21: 660-667. **Mercier, M. L.**—Le polymorphisme du mâle (poecilandrie) chez Cynomyia mortuorum (Calliphorinae). [69] 187: 1003-1005. ***Saunders, L. G.**—Some marine insects of the Pacific Coast of Canada. [7] 21: 521-545, ill. **Saunders, L. G.**—The early stages of Diamesa (Psilodiames) lurida (Chironomidae). [4] 60: 261-264, ill. **Stehli, G.**—Merkwürliges insektenleben im petroleum. [Kosmos] 25: 409-411, ill. ***Walley, G. S.**—The genus Tanypus in Canada, with a key to the North American species (Chironomidae). [7] 21: 581-592, ill.

HYMENOPTERA.—Chandler, L. G.—Notes on two grasshopper-wasps. [Victorian Nat.] 45: 176-181. **Heinrich, G.**—Die Kennzeichen der Ichneumoninen auf ihren arttrennenden wert. [56] 7: 203-213. **Nowicki, S.**—Bemerkungen zur gattung Asecodes (Chalc. Euloph. Ented. Omphal.). [56] 7: 223-230, ill. **Quilis, M.**—Los apidos de España. Estudio monografico de las Dasypoda. [EOS] 4: 173-241, ill.

KLIMA UND ENTWICKLUNG, by Dr. FRITZ ZWEIGELT. Entomologischer Anzeiger, Vienna, Volume VIII, (9) p. p. 93-94, (10) p. p. 99-100, (11) p. p. 107-114, 1928. The author lays stress on the fact that development of insect life depends mostly upon external forces, as climate, temperature, ecology, and others. He gives a few examples: "*Pieris rapae* and other butterflies require a certain average summer-temperature for their development. *Mimas tiliae* if fed on birch, almost invariably produces the *brunnea-form*. *Phylloxera vastatrix* and *P. vitifoliae* are becoming more restricted every year, even to the point where one certain grape variety is required for its development, namely the one which responds to its sting in gall producing. *Acherontia atropos* can only complete its normal development in the warmest climates, as specimens which mature in cooler climates in fall do not possess the regenerative faculty. The larvae of *Polyphylla* can not adapt themselves to every soil." A chart is given showing the flight years of the respective three and four year races of the May beetle, (*Melolontha* species) also a chart showing the boundaries where the races *Melolontha melolontha, M. hippocastani, M. h. nigripes*

and *M. pectoralis* abound. Charts showing the vertical plague-boundary and isothermal map are also given. Based upon these studies it is proven that the climate is the positive and the soil the negative factor in the distribution of the May beetles (*Melolontha* species). The author deplores the wholesale naming of varieties, forms, races, aberrations, etc., as most of these are only based upon external factors, and hopes that entomologists will rather study the reason for variation than create an everlasting amount of synonomy, which has no value. The article is well worth serious thought.—FRANK HAIMBACH.

THE PRINCIPLES OF SYSTEMATIC ENTOMOLOGY. By G. F. FERRIS, Stanford University Publ. Biol., Vol. 5, No. 3, 1928, 169 pp., 11 figs., Stanford University Press, paper $2.00, cloth $2.75.—This book, the first of its kind, is a stimulating discussion of methods in systematic entomology, with suggestions for the betterment thereof, that should be carefully studied by younger systematists, and could be heeded, not unprofitably, by many of their elders. The author terms his work "a frankly critical survey of the existing conditions in systematic entomology," but as it is critical of practices more than of people, probably not as much opposition will be aroused as the author seems to expect.

There are not many chapters, and citation of their headings will serve briefly to indicate the scope of the book. These are: 1., The contribution of the systematist to biology; 2, The scope of systematic biology; 3, The principles of systematic entomology; 4, The segregation of species; 5, Categories less than the species; 6, The morphological basis of systematic entomology; 7, The preparation of material; 8, Entomological drafting; 9, The description of species; 10, Classification; 11, Nomenclature, and 12, The training of the systematist.

Although the reviewer has been asked by Ferris to comment on his book in a critical way, he finds himself in most cases impelled to reinforce rather than oppose the arguments presented. For instance, as to the place of the systematist in the scheme of things biological. There are those who regard the taxonomist as a servant in the house of biology, an attitude of ignorant bumptiousness, which the views of a biologist of the standing of Raymond Pearl (quoted by Ferris), should help to alleviate. The "disrepute" of taxonomy to which the author alludes is due to its being judged by standards different from those applied by critics in their own fields. Their num-

erous failures have been condoned, while taxonomy because not infallible, has been condemned. The taxonomist, however, need not worry over the attitude of critics; in the end they must come to him, must accept his findings, and defer to his judgment, be it with ever so little grace.

Ferris is much more sympathetic with the querulities of geneticists and other experimental biologists towards systematic work than the reviewer would be. Wonder and even pain have been expressed that systematists do not adopt the findings of the laboratory workers, but why anyone should ever have expected close team-work is a more legitimate reason for surprise. The laboratory group for the most part work under controlled conditions and with abnormalities, while the systematist seeks the normal product of natural conditions, in fact rejects all abnormalities. Even were some of the laboratory work applicable in classification, it would be impracticable to use it, because the element of time alone would render impossible similar analysis of all comparable organisms, which the systematist would have to consider. In other words classification must rest on characters known for all members of the group concerned, and we never shall have complete chromosome or other biological analysis of insects or even of any considerable group of them.

Hence we must proceed on the basis of structure, and Ferris does well to dwell on the responsibilities of the systematist as a morphologist. Again, however, there is little doubt that strict morphologists have gone to extremes where systematists have not felt justified in following. The theoretically inclined morphologist, in particular, is an unsafe guide, and it does not take long to reveal that his work is too much in a state of flux to furnish the solid basis needed for satisfactory classification.

The author in several places warns against the description of species being mistaken for systematic entomology. It may be part of it, but the lowest part; what is needed throughout is improvement, refinement, of classification, in other words of more and more thorough revisional work. Description of species is necessitated in revisions but it is not the main objective, and, paraphrasing an aphorism, we may say that if systematists will take care of revisions, species will take care of themselves. Ferris well says "The writer who contributes to the genuine knowledge of species is accomplishing far more than one who merely names them."

Within the limits of a review it is impossible to comment on the many interesting points raised in Professor Ferris' book.

The author is especially qualified to write upon morphology as applied to classification, and to give advice on entomological illustration. His insistence upon the importance of adequate illustration of papers on systematic entomology is not too strong, and by implication condemns the requirement of numerous entomological publications that authors pay engraving costs, a practice that certainly discourages illustration. The reprinting in the book of the International Code of Nomenclature (a singularly inaccessible document) and of the Committee decisions pertinent to entomology in itself should result in considerable demand for the work.

Propositions in the book, with which the reviewer finds himself more or less in disagreement include the following. Ferris thinks all data of every kind available should be used in connection with the segregation of species; the reviewer would urge that it is practicable to use only those which we have uniformly for all forms in the group being revised. His first 3 paragraphs in chapter VI practically admit this contention. Ferris says he disagrees with the reviewer as to the necessity of being satisfied with approximations to the truth in classificatory work, but we do not take this literally, for however much the approximations are refined, they remain approximations. This is the nature of science, and its distinction from dogma. The author says also he does not agree with the reviewer's ideas on naming lower than specific forms of insects, but the reasons for naming them are the same as in the case of other groups. Lacking a name knowledge does not accumulate. The varieties of today are the species of tomorrow (see Ferris on pyramiding, p. 124). As to criteria for recognition of genera and higher groups, the reviewer would not pay much attention to average number of units in a group, nor to "hollow curves," but would urge that the test of intergradation be applied throughout from the lowest to the highest groups in making decisions as to what should be united and what separated. In the lower categories usually it is the condition as to intergradation of single characters, that we must observe, and, in the higher, of combinations of characters.

Upon the topic of the training of systematists, it might be added that usually they must be self-trained, and good systematic work requires the highest talents. In this final chapter, particularly, but scattered throughout the book, Ferris has concisely stated truths and cogent criticisms which if read and incorporated into their consciousness by systematists cannot but have the effect of improving their output and elevating the standards of the science.—W. L. McAtee.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

Argynnis of the world wanted by exchange for local Lepidoptera, or by purchase. S. P. Hayes, Jr., Amherst College, Amherst, Mass.

Wanted for cash, Catocala eggs: cara, vidua, obscura, residua, ultronia, retecta, praeclara, amatrix, unijuga, pura, insolabilis, lacrymosa, judith.—E. W. K. Schwarz, 40 W. 84th St., New York City.

Wanted—Lepidoptera, especially Lycaenidae and Hesperiidae, from all localities, in exchange for local Lepidoptera. Harold I. O'Byrne, 501 Pacific Ave., Webster Groves, Missouri.

Wanted—The Linnean Society of New South Wales, whose library is the only one in Australia recorded as receiving "Entomological News," is anxious to obtain a copy of the February, 1927, issue to complete its file. A. B. Walkom, Secretary, 16 College Street, Sydney, Australia.

Exchange—Will exchange California specimens for any of your locality. What have you to offer? Correspondence solicited. John Imschweiler, 748 N. Eucalyptus Ave., Inglewood, California.

Wanted—Blues, Coppers, Hairstreaks of all States, also Euchloe genutia. Norman R. Gunn, 1951 Yosemite Road, Berkeley, Calif.

Wanted—Specimens of Psammocharidae, particularly of the subfamily Pepsinae, from North America, Central America and West Indies. Will buy or borrow material for study.—K. A. Salman, Fernald Hall, Amherst, Mass.

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